

WHAT IS CLAIMED IS:

1. A system for head positioning control that includes seek control, used to move a head to a target position on a disk, and track following control, used to position the head in a target area related to the target position, comprising:

means for detecting a position error between a position of the head and the target position;

means for calculating, from the position error, a feedback value used to eliminate the position error;

adaptive learning means for acquiring, by adaptive learning, a runout component that is included in the position error and synchronous with a rotation of the disk;

means for calculating a feedforward value used to suppress the runout component acquired by the adaptive learning means;

means for generating, from the feedback value and the feedforward value, a control amount used to position the head in the target position;

a rewritable memory to store initial values used in adaptive learning executed by the adaptive learning means, the initial values being values of the runout component obtained in respective predetermined radial positions on the disk; and

determination means for selecting, from the memory, one of the initial values, used in adaptive

202509165001

learning by the adaptive learning means, in accordance with the target position, and supplying the selected initial value to the adaptive learning means.

2. The system according to claim 1, wherein the  
5 determination means includes means for replacing, when it is necessary, during the track following control, to switch the track following control to the seek control for moving the head to a new target position, one of the initial values stored in the memory, with  
10 a latest value of the runout component acquired by the adaptive learning means, the one of the initial values corresponding to a present head position.

3. The system according to claim 1, wherein the  
15 determination means includes means for replacing, each time the adaptive learning means acquires a value of the runout component, one of the initial values stored in the memory, with the value of the runout component, the one of the initial values corresponding to  
a present head position.

20 4. The system according to claim 1, further comprising control means for causing, upon activation of the disk drive, the adaptive learning means to acquire, by adaptive learning, the values of the runout component in the respective predetermined  
25 radial positions on the disk, thereby storing the values of the runout component acquired in the respective predetermined radial positions, in the

20250915 043402

memory.

5. The system according to claim 1, further comprising:

5 a nonvolatile memory to prestore the values of the runout component acquired in the respective predetermined radial positions on the disk; and

10 correction means for causing, upon activation of the disk drive, the adaptive learning means to acquire, by adaptive learning, a value of the runout component in a predetermined radial position on the disk, the correction means also estimating the values of the runout component acquired at present in the respective predetermined radial positions on the basis of the value of the runout component acquired by the  
15 adaptive learning means in the predetermined radial position, and on the basis of the values of the runout component corresponding to the respective predetermined radial positions, and storing the estimated values of the runout component in the rewritable  
20 memory, the values of the runout component corresponding to the respective predetermined radial positions being stored in the nonvolatile memory.

25 6. The system according to claim 1, wherein the determination means divides the disk into a plurality of zones corresponding to the respective predetermined radial positions on the disk, thereby managing the plurality of zones, selecting, from the memory,

a value the runout component corresponding to one of the zones, to which the target position belongs, and using the selected value as one of the initial values.

7. The system according to claim 1, wherein:

5           the seek control enables one of two heads, which correspond to respective two recording surfaces of the disk, to be moved to the target position, the one of the heads corresponding to one of the recording surfaces, on which the target position exists;

10           the memory stores, for each of the recording surfaces of the disk, the values of the runout component obtained in the respective predetermined radial positions, the values of the runout component being used as the initial values in adaptive learning  
15           executed by the adaptive learning means; and

          the determination means selects, from the memory, one of the initial values used in adaptive learning executed by the adaptive learning means, the one of the initial values corresponding to the one of the  
20           recording surfaces on which the target position exists, and corresponding to the target position.

8. The system according to claim 1, wherein:

          the seek control enables one of heads, which correspond to respective recording surfaces of  
25           a plurality of disks each including at least one recording surface, to be moved to the target position, the one of the heads corresponding to one of the

10059456 014100

recording surfaces, on which the target position exists;

the memory stores, for each of the recording surfaces of the disk, the values of the runout component obtained in the respective predetermined radial positions, the values of the runout component being used as the initial values in adaptive learning executed by the adaptive learning means; and

the determination means selects, from the memory, one of the initial values used in adaptive learning executed by the adaptive learning means, the one of the initial values corresponding to the one of the recording surfaces on which the target position exists, and corresponding to the target position.

9. A system for head positioning control that includes seek control used to move a head to a target position on a disk, and track following control used to situate the head in a target area related to the target position, comprising:

means for detecting a position error between a position of the head and the target position;

means for calculating, from the position error, a feedback value used to eliminate the position error;

adaptive learning means for acquiring, by adaptive learning, a runout component that is included in the position error and synchronous with a rotation of the disk;

100594561001

means for calculating a feedforward value used to suppress the runout component acquired by the adaptive learning means;

5 means for generating, from the feedback value and the feedforward value, a control amount used to situate the head in the target position;

10 a rewritable memory to store runout characteristic information indicative of the relationship between the runout component and a radial position on the disk, and obtained from values of the runout component obtained in respective predetermined radial positions on the disk; and

15 determination means for estimating a value of the runout component in the target position, on the basis of the target position and the runout characteristic information stored in the memory, and supplying the adaptive learning means with the estimated value of the runout component as an initial value necessary for adaptive learning executed by the adaptive learning  
20 means.

25 10. The system according to claim 9, further comprising control means for causing, upon activation of the disk drive, the adaptive learning means to acquire, by adaptive learning, the values of the runout component in the respective predetermined radial positions on the disk, thereby acquiring the runout characteristic information on the basis of a

10054564001

learning result, and storing the runout characteristic information in the memory.

11. The system according to claim 9, further comprising:

5           a nonvolatile memory to prestore the runout characteristic information obtained from the values of the runout component in the respective predetermined radial positions on the disk; and

10           correction means for causing, upon activation of the disk drive, the adaptive learning means to acquire, by adaptive learning, a value of the runout component in a predetermined radial position on the disk, the correction means also estimating a runout characteristic indicative of the present relationship  
15           between the runout component and a radial position on the disk on the basis of the value of the runout component acquired by the adaptive learning means in the predetermined radial position, and the runout characteristic information stored in the nonvolatile  
20           memory, and storing the estimated values of the runout component in the rewritable memory.

12. The system according to claim 9, wherein:

25           the seek control enables one of two heads, which correspond to respective two recording surfaces of the disk, to be moved to the target position, the one of the heads corresponding to one of the recording surfaces, on which the target position exists;

10059156.0140  
207E10.9576500F

the memory stores, for each of the recording surfaces of the disk, the runout characteristic information; and

5 the determination means estimates a value of the runout component in the target position on the basis of the target position, and the runout characteristic information which is included in the runout characteristic information stored for each recording surface in the memory, and corresponds to one of the recording surfaces on which the target position exists.

13. The system according to claim 9, wherein:

207410 957500T  
15 the seek control enables one of heads, which correspond to respective recording surfaces of a plurality of disks each including at least one recording surface, to be moved to the target position, the one of the heads corresponding to one of the recording surfaces, on which the target position exists;

the memory stores, for each of the recording surfaces of the disk, the runout characteristic information; and

25 the determination means estimates a value of the runout component in the target position on the basis of the target position, and the runout characteristic information which is included in the runout characteristic information stored for each recording surface in the memory, and corresponds to one of the



recording surfaces on which the target position exists.

14. A disk drive apparatus comprising:

at least one disk including at least one  
5 recording surface;

a rotary actuator that supports at least one head provided corresponding to the at least one recording surface of the at least one disk, and drives the at least one head in a radial direction of the at least one disk, the at least one head being used to  
10 read/write data from and into the at least one recording surface; and

a head positioning control system configured to drive the rotary actuator to thereby execute seek control to move the at least one head to a target position on the at least one disk, and execute track following control to position the at least one head in a target area related to the target position,  
15 including:

20 means for detecting a position error between a position of the at least one head and the target position;

means for calculating, from the position error, a feedback value used to eliminate the position  
25 error;

adaptive learning means for acquiring, by adaptive learning, a runout component that is included

201003030000

in the position error and synchronous with a rotation of the at least one disk;

means for calculating a feedforward value used to suppress the runout component acquired by the adaptive learning means;

means for generating, from the feedback value and the feedforward value, a control amount used to position the at least one head in the target position;

a memory to store values of the runout component, which are obtained in respective predetermined radial positions on the at least one disk and are used as initial values in adaptive learning executed by the adaptive learning means; and

determination means for selecting, from the memory, one of the initial values, used in adaptive learning by the adaptive learning means, in accordance with the target position, and supplying the selected initial value to the adaptive learning means.

15. A disk drive apparatus comprising:

at least one disk including at least one recording surface;

a rotary actuator that supports at least one head provided corresponding to the at least one recording surface of the at least one disk, and drives the at least one head in a radial direction of the at least one disk, the at least one head being used to

read/write data from and into the at least one  
recording surface; and

a head positioning control system configured to  
drive the rotary actuator to thereby execute seek  
control to move the at least one head to a target  
position on the at least one disk, and execute track  
following control to position the at least one head in  
a target area related to the target position,  
including:

means for detecting a position error between  
a position of the at least one head and the target  
position;

means for calculating, from the position  
error, a feedback value used to eliminate the position  
error;

adaptive learning means for acquiring, by  
adaptive learning, a runout component that is included  
in the position error and synchronous with a rotation  
of the at least one disk;

means for calculating a feedforward value  
used to suppress the runout component acquired by the  
adaptive learning means;

means for generating, from the feedback  
value and the feedforward value, a control amount used  
to position the at least one head in the target  
position;

a memory to store a runout characteristic

10050456 01102

indicative of the relationship between the runout component and a radial position on the at least one disk, and obtained from values of the runout component obtained in respective predetermined radial positions on the at least one disk; and

determination means for estimating a value of the runout component in the target position, on the basis of the target position and the runout characteristic stored in the memory, and supplying the adaptive learning means with the estimated value of the runout component as an initial value necessary for adaptive learning executed by the adaptive learning means.

16. A method of executing head positioning control that includes seek control used to move a head to a target position on a disk, and track following control used to position the head in a target area related to the target position, comprising:

pre-acquiring, by learning, values of a runout component synchronous with a rotation of the disk, in respective predetermined radial positions on the disk; calculating a feedback value on the basis of a position error between a head position and the target position to thereby eliminate the position error, each time the position error is detected;

acquiring, by adaptive learning, a value of the runout component contained in the position error, at least during the track following control, each time

202510195500T

the position error is detected;

selecting an initial value, used in the adaptive learning, from the values of the runout component pre-acquired in the respective predetermined radial positions, in accordance with the target position;

calculating a feedforward value to suppress the runout component acquired by the adaptive learning; and

generating, from the feedback value and the feedforward value, a control amount used to position the head in the target position.

17. A method of executing head positioning control that includes seek control used to move a head to a target position on a disk, and track following control used to position the head in a target area related to the target position, comprising:

pre-acquiring, by learning, values of a runout component synchronous with a rotation of the disk, in respective predetermined radial positions on the disk, and extracting a runout characteristic indicative of the relationship between the runout component and a radial position on the disk;

calculating a feedback value on the basis of a position error between a head position and the target position to thereby eliminate the position error, each time the position error is detected;

acquiring, by adaptive learning, a value of

20250909 013102

the runout component contained in the position error,  
at least during the track following control, each time  
the position error is detected;

5       estimating an initial value, used in the adaptive  
learning, from the target value and the extracted  
runout characteristic;

      calculating a feedforward value to suppress the  
runout component acquired by the adaptive learning;  
and

10       generating, from the feedback value and the  
feedforward value, a control amount used to position  
the head in the target position.

20110101 09:56:00